Balanomorph Barnacles on *Chrysemys alabamensis*

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The Alabama red-bellied turtle, *Chrysemys alabamensis* (Baur) ranges from Apalachee Bay, Florida to Mobile Bay, Alabama, in marshes and mangrove-bordered creeks and other bodies of brackish or fresh water (Conant, 1958). Although *C. alabamensis* was described prior to the turn of the century (Baur, 1893), it remained so poorly known that even its taxonomic validity was in doubt until the work of Carr and Crenshaw (1957). During studies on the insular herpetofauna in the upper Gulf of Mexico, we had the opportunity of studying a specimen of this seldom-observed turtle that was heavily fouled by the balanomorph barnacle *Balanus improvisus* Darwin (Fig. 1). Fouling by balanomorphs, and the occurrence near an offshore island, suggest that *C. alabamensis* is relatively salt tolerant as Carr (1952) indicated for the congeneric *C. concinna mobilensis* (Holbrook) and *C. concinna suwanniensis* (Carr), which also occur in coastal areas of the upper Gulf. Previously Carr (1940) had noted the presence of barnacles on several individuals of the latter in a heap of shells at Cedar Key, Florida.

The turtle was collected by W. T. Seibels on 17 December 1968 in shallow water off Dauphin Island, Mobile County, Alabama (approximately 30°10′51.6″N, 88°15′12″W), which is one of several islands fronting Mobile Bay. The specimen, an adult male now housed in the collections of the University of South Alabama (USA-1253), measures as follows (in mm): carapace length 262, carapace width 186, plastron length 228, anterior plastral width 105, posterior plastral width 104, bridge width 84, shell depth 107, head width 34.5. The right side of the carapace shows evidence of multiple injuries, all of which are well healed, and were probably incurred when the turtle was much younger.

Balanus improvisus ranges widely in the Caribbean and Atlantic, and has been reported from other regions about the world (Utinomi, 1966; Carlton and Zullo, 1969). It is commonly found in the intertidal zone and in shallow water estuarine environments on inanimate objects as well as in association with oysters and other mollusks adapted to reduced salinities (Newman, 1967; Carlton and Zullo, 1969). Because *B. improvisus* is able to conform osmotically

Fig. 1. Dorsal view of the Alabama red-bellied turtle *Chrysemys alabamensis* (Baur) fouled by the littoral barnacle *Balanus improvisus* Darwin.

and remain active in low salinity waters for indefinite periods, it is regarded as a highly successful estuarine species (Newman, 1967). But low resistance to dessication is probably the limiting factor to its successful settlement and widespread occurrence on turtles that spend long periods out of water.

More than 600 barnacles settled on the carapace of *C. alabamensis.* We measured 513 of these, which ranged in size from 1.0-10.2 mm, with a mean value of 4.2 mm. All of the specimens fall into five size classes, probably from successive larval settlements in one or more seasons. Under natural conditions at Beaufort, North Carolina, *B. improvisus* reaches a rostro-carinal diameter of 4-5 mm in about 20 days (Costlow and Bookhout, 1957). We estimate that nearly all of the present specimens are probably no less than two days and no more than 10 weeks old. Several individuals have reached a size that possibly indicates settlement during a previous season, and thus are much older than 10 weeks.

Cypris larvae of intertidal and shallow water balanomorphs not only select a particular site for attachment but orient at settlement in response to either light intensity, water movement or currents, surface contour or texture, or a combination of these (Crisp and Barnes, 1954; Crisp and Stubbings, 1957). During the growth period after attachment the barnacle may reorient in response to water currents (Moore, 1933). From our study of the present specimens it appears that 1) settlement was wholly within the interlaminal grooves or in striae in the surface of the laminae, 2) apparently all barnacles in the same groove are similarly oriented, 3) there is no predominant angle of orientation with respect to the antero-posterior axis of the turtle, and 4) none of the specimens appear to have changed their initial orientation.

Present evidence suggests that true turtle barnacles and whale barnacles orient initially in response to water currents (Crisp and Stubbings, 1957). In general, these barnacles adopt an orientation with the cirral net facing directly into the current, thereby maximizing the fishing capabilities of the net which is employed in gathering food. The barnacle, however, is capable of partially rotating the net and this may account for variations in the angle of orientation from the antero-posterior axis of the host. Although much of the work on barnacle settlement has been done with artificial, essentially planar surfaces, we believe that future studies should be made on models with a laminar spindle configuration. Use of such models would go a long way in helping to explain the occurrence of intertidal as well as turtle barnacles on one area of the host and not on another, and would also help to explain gross variations in orientation of the barnacles from one position to another on the same turtle.

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